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VOLTAGE DIVIDERS
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LOW INPUT RESISTANCE VOLTAGE DIVIDERS

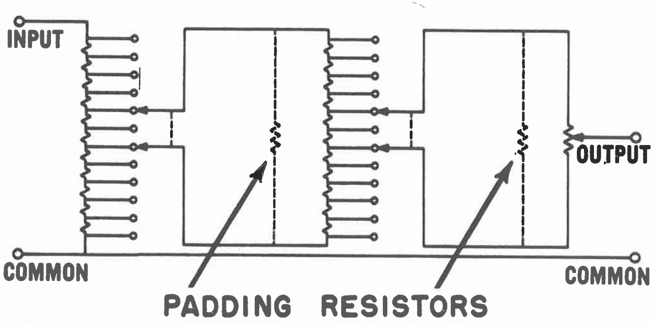
The plan of using a low resistance divider to avoid loading problems is very inviting and often successful. But, as with many other ideas, it has possible pitfalls if carried to extremes.

Two major problems develop.

First, the resistors used in the later decades have too low a resistance for practical construction so a technique known as padding is used. The decade is made from larger resistance units and the entire decade is shunted to the value necessary for proper loading of the previous decade. This does not affect the input resistance but it does increase the output resistance.

Second, the effect of the contact resistance between decades causes a linearity error at both zero and full scale setting. Padding reduces this error.

As an example, the following table gives the maximum output resistance and end linearity error to be expected for DP-211 DEKAPOT® decade potentiometers of several resistance values.



R_{in}	Maximum Output R	End Lin. ppm
100 K	31 K	0.03
50 K	15.5 K	0.06
10 K	3.1 K	0.3
5 K	1.55 K	0.6
1 K	320	3
500	172	6
100	55	30
50	40	60
10	30	220

The interpolating potentiometers on all of the units of one kilohm or less input resistance in these examples are padded 100 ohm variable resistors. In addition the 10 ohm unit has a padded 10 ohm second deck. Other padding combinations are used from time to time. In the case of the 10 ohm unit the padding indicated reduces the end linearity error contribution from 300 ppm to 220 ppm. At the same time the maximum output resistance is increased from 3.2 ohms to 30 ohms.

Low output resistance units (less padding) can be built but to do so usually entails a considerable increase in cost and a longer delivery time in addition to the increased linearity error. Unless the low output resistance is specifically asked for the units will be built for maximum accuracy and economy.

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